

## Study electron neutrino events

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Steps:

- Particle identification , study various variables
- Complete Missing Momentum Info
- Repeat with Monte Carlo
- Tune up cuts
- Select and study  $\nu_e$  events

### Preliminary Study

**Step 1** : Project track to EMCAL. Plot distance of track from the cluster centroid (**Fig 1**) for:

- a. All clusters
- b. Best cluster
- c. Cluster == one EMCAL block

**Result:** distance cut = 0.2 m

**Step 2:** Identify muons: Use 'tpid', and 'E/p'

Muon := At least 4 hits in the Muon ID system .

**Fig 2:** Plot E/p for

- a. muons, with dist <0.2 m
- b. muons, with dist <0.2 m, and cluster == 1 block

**Result: Muons have  $E/p < 0.1$**

**Step 3:** Identify hadrons, electrons

Hadron :=

Dist  $< 0.2$  m

3 or less hits in Muon ID system

$0.1 < E/p < 0.8$

Electron :=

Dist  $< 0.2$  m

3 or less hits in Muon ID

$0.8 < E/p < 1.2$

**Step 4:** Identify gammas

$E\_Gamma := 1.2 < E/p$  or  
Not assigned track

With the above “particle identification” see Figs 3,4,5

**Fig. 3:** Momentum distributions for hadron-like events: (a) from the “muons” file periods 3,4, and (b) from the no\_muons file, periods 3,4

**Fig 4 :**  $E/p$  for “muons” and “nomuons” files , per 3,4. Bottom row is  $E/p$  for “electrons”

**Fig 5: Top row, Left: Muon momentum distribution.**  
**Right: “numu energy distribution”.**  
**Bottom Row:Right: enu energy distribution.**

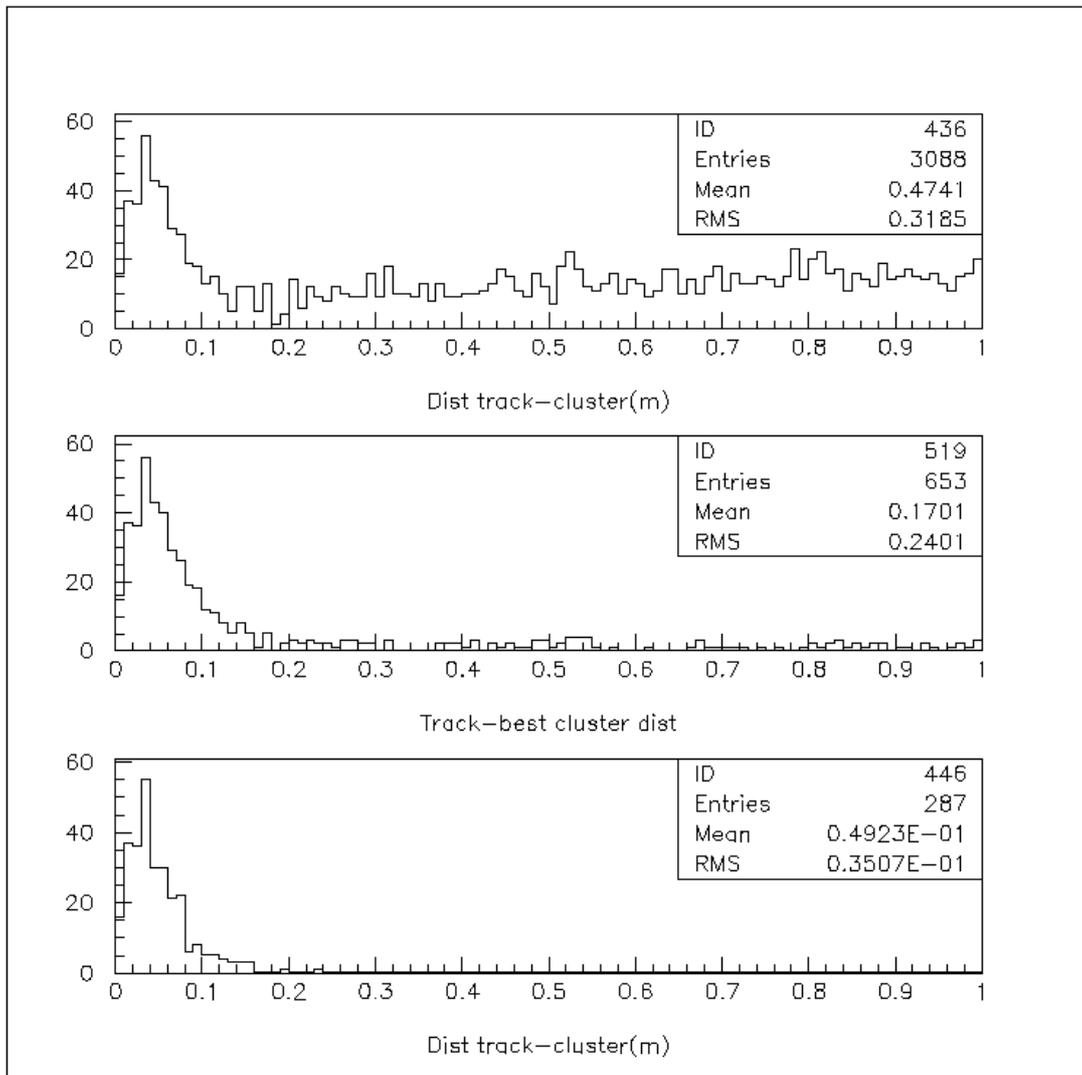


Fig. 1 : Muon run. Distance of track to cluster berycenter: (a) all combinations (b) Best cluster (c) Clusters with 1 block only.

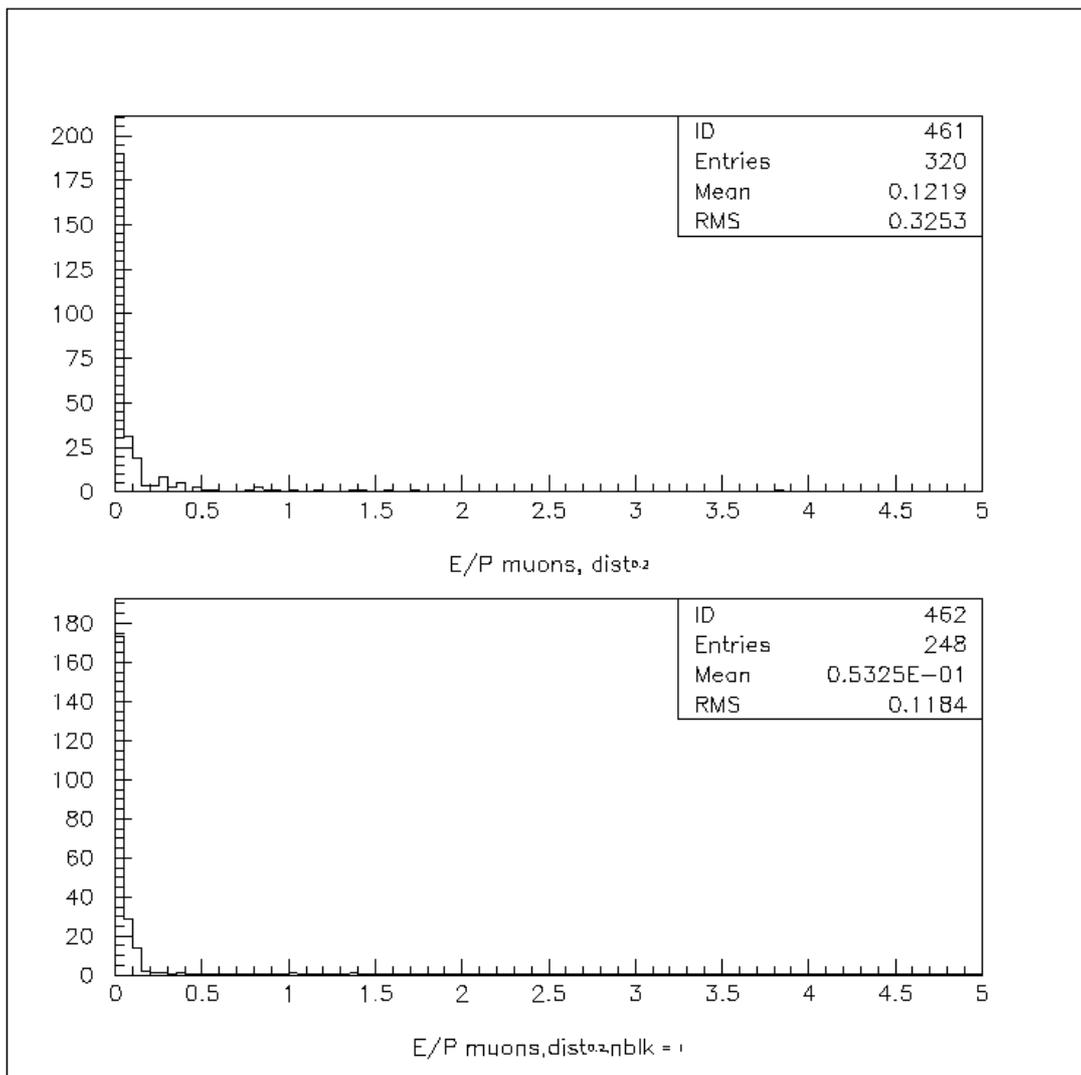


Fig 2: Muon run:  $E/p$  for muons with: (a)  $\text{dist} < 0.2$  m,  
 (b)  $\text{dist} < 0.2$  m, 1 block/cluster

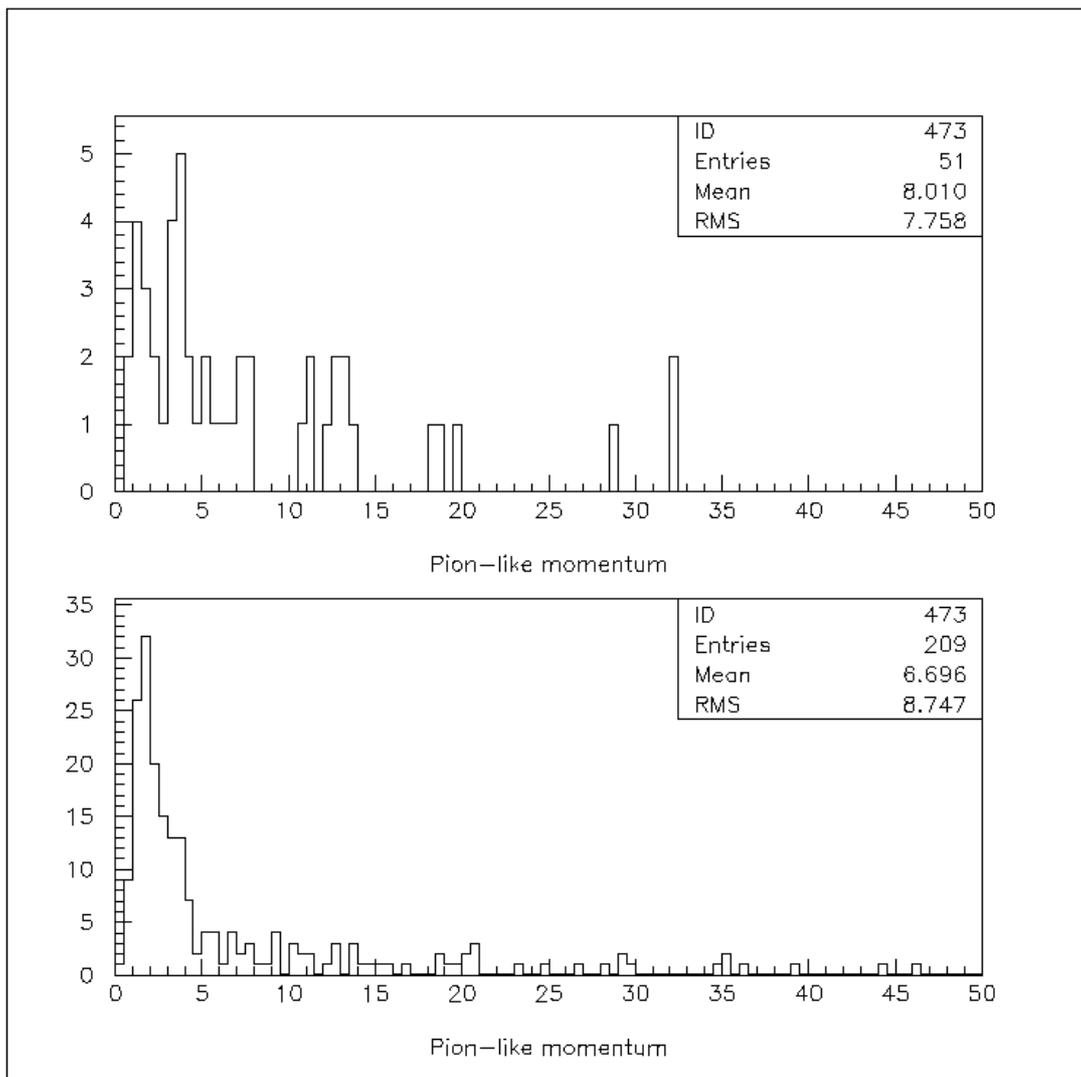


Fig 3: Momentum for hadron-like tracks: (a) Muons , (b) Nomuons

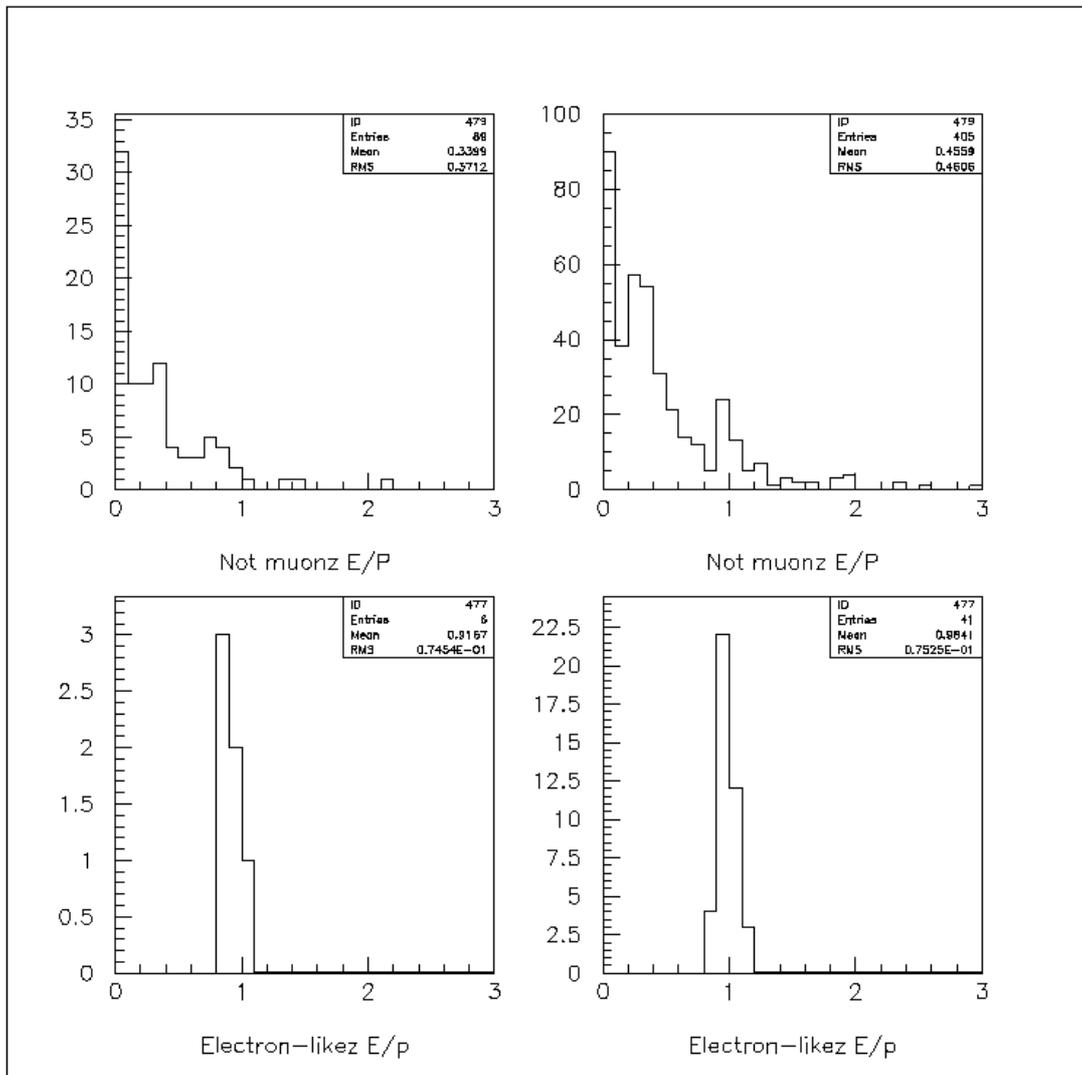


Fig 4:  $E/p$  for: (A) Left column: Muons , (B) Right Column: Nonmuons

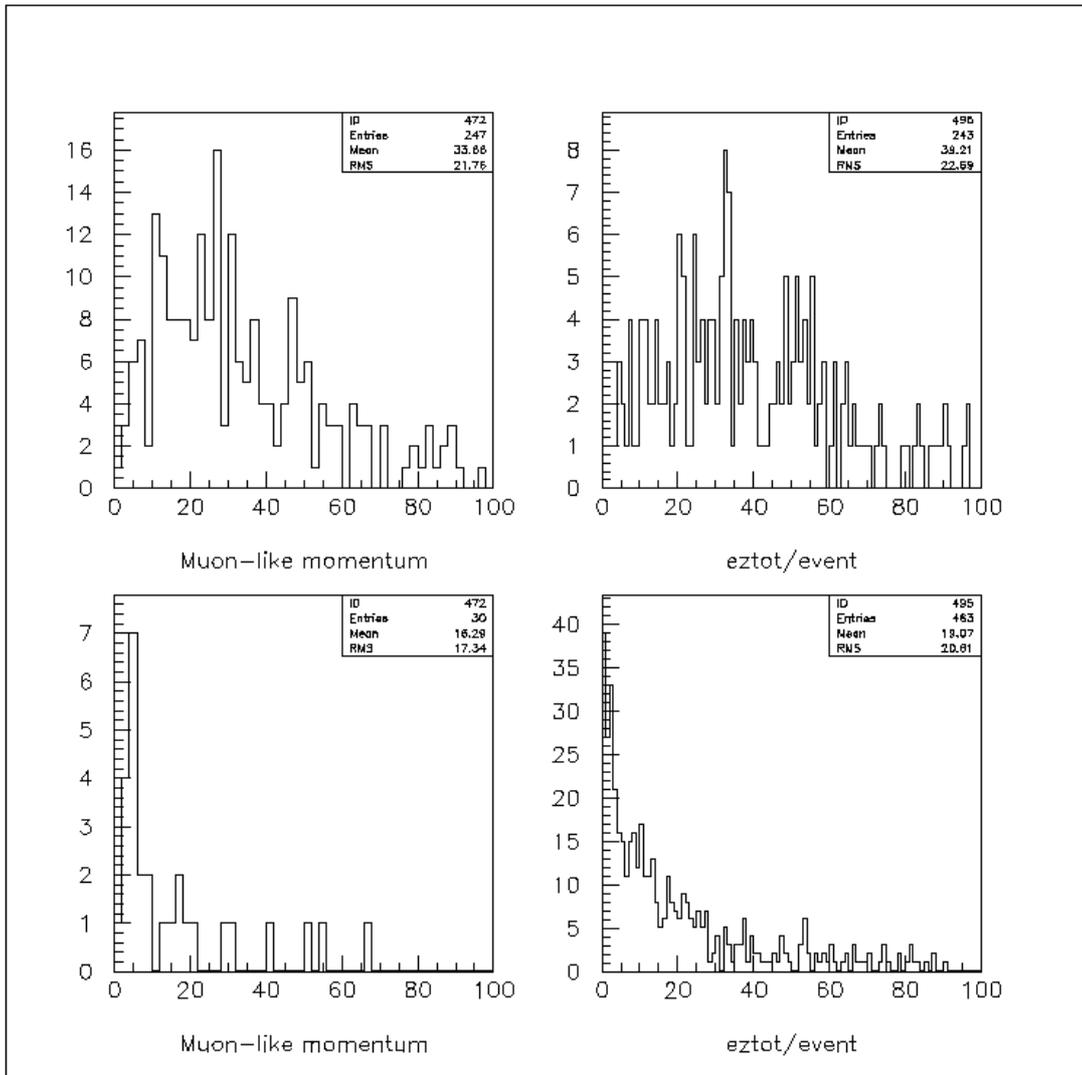


Fig. 5 (A) Top row: Muons (B) Bottom row: NoMuons. R Col: Neutrino energy distribution for “numu” (top) and “nue + NC” (bottom).